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USE OF GIS TO DELIMIT HAZARD ZONES FOR LARGE DEBRIS FLOWS AT VOLCAN COLIMA, MEXICO

SHERIDAN, Michael F., HUBBARD, Bernard, and HOOPER, Donald, Department of Geology, SUNY at Buffalo, Buffalo, NY 14260; mfs@acsu.buffalo.edu, Abrams, Michael, Jet Propulsion Laboratory, Pasadena, California

Volcan Colima, a decade volcano, is the most active volcano in Mexico. Large explosions during 1998 and 1999 produced ash-laden plumes that rose several kilometers above the summit. Associated pyroclastic flows occurred down the southern flanks with increasing frequency during this period. Apparently this volcano is approaching the climactic phase of its approximately 100-year cycle and a major eruption could occur within the next decade. As the eruptions become more powerful and increasing amounts of fine volcanic ash cover the region around the volcano, the potential for volcanic mudflows is enhanced. This paper identifies zones that have the greatest potential to be inundated by debris flows consisting of volcanic ash remobilized by heavy rainfall or initiated by slides triggered by earthquakes.

Assuming that potential source areas for debris flows would be located in zones where accumulation of new volcanic ash is thickest, debris flows are likely to move down two major river systems that pass the volcano, Rio Tuxpan to the east and Rio Armeria to the west. Lahar volumes of 3 magnitudes (10^6 to 10^8 m3) were simulated by ArcInfo based on a DEM with 90 m grid of topography. Inundation zones for these flows have been computed using a model developed by Iverson and others (1998) based on geometry of debris flows in the Cascade Range. This GIS code calculates flow cross sectional area to plot the width of the peak flow in the river valleys and uses planimetric area to map the flow extent. ArcInfo allows a calculation of depth at various locations by profiling valley cross sections. The largest lahars (10^8 m3) would have a peak depth of about 60 m and a runout of about 60 km. The smallest lahars examined (10^6 m3) would have a peak height of about 7 m and would only reach about 3 km from their source. Mudflows of all studied magnitudes remain within the principal valleys of the two rivers. Unfortunately, a large lumber-producing town, Atenquique, is at high risk for moderate to large lahars because it is near the volcano and at the bottom of a deep canyon. A detailed map and sectional profiles of topography at Atenquique show the effect of mudflows on this inhabited area. These models should be helpful for risk planning at Volcan Colima.